United States Patent [19]

deFilippis et al.

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[54] **LASER AIMING DEVICE FOR WEAPONS**

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[51] **Int. Cl.**[2] **F41G 1/34**

[52] **U.S. Cl.** ..... **362/113;** 42/1 A

[58] **Field of Search** ..... 42/1 A; 33/247, 248; 362/110, 111, 112, 113, 114, 425

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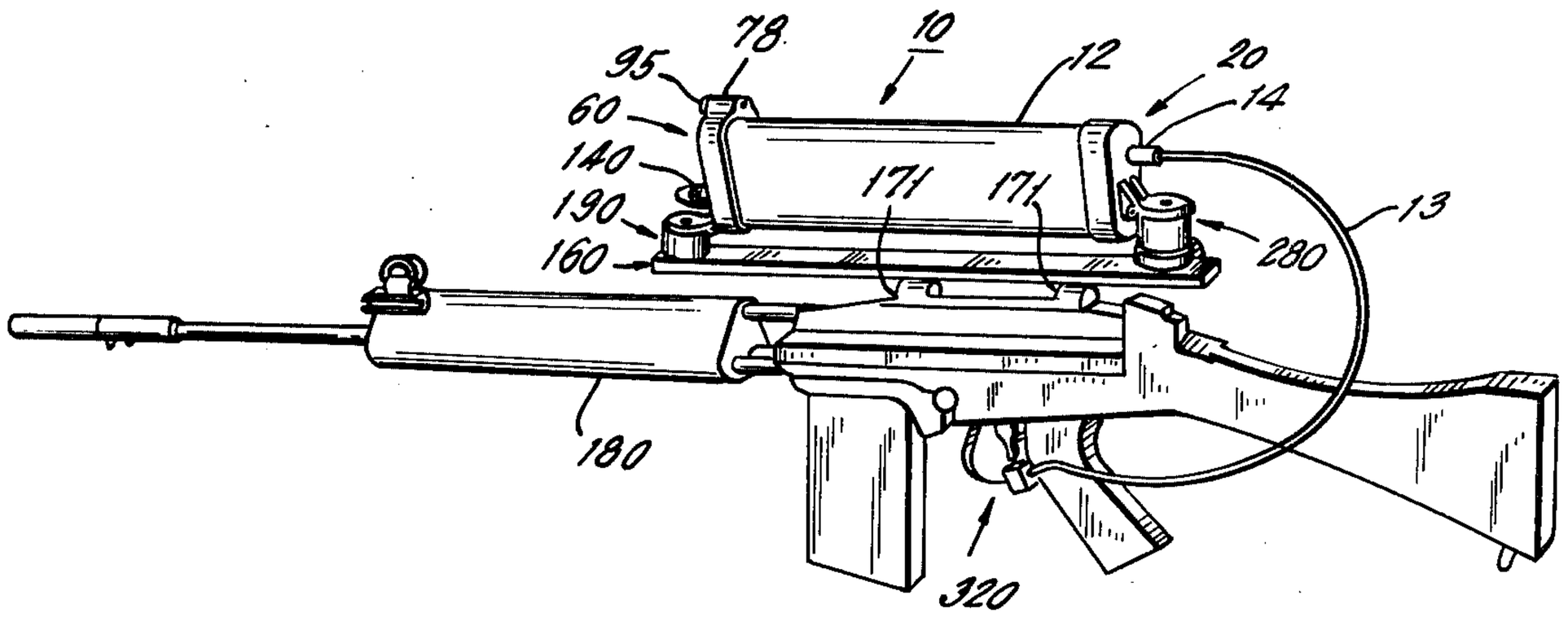
Primary Examiner—Stephen C. Bentley

Attorney, Agent, or Firm—Ostrolenk, Faber, Gerb & Soffen

[57] **ABSTRACT**

A laser is attached to a weapon and its beam is aimed toward the target; the aiming point of the laser beam is adjustable with respect to the aiming point of the weapon; a lever for operating the laser is located to be operated as the trigger of the weapon is operated and to cause the laser to shine light at the target before the trigger has been operated enough to fire the weapon.

20 Claims, 21 Drawing Figures



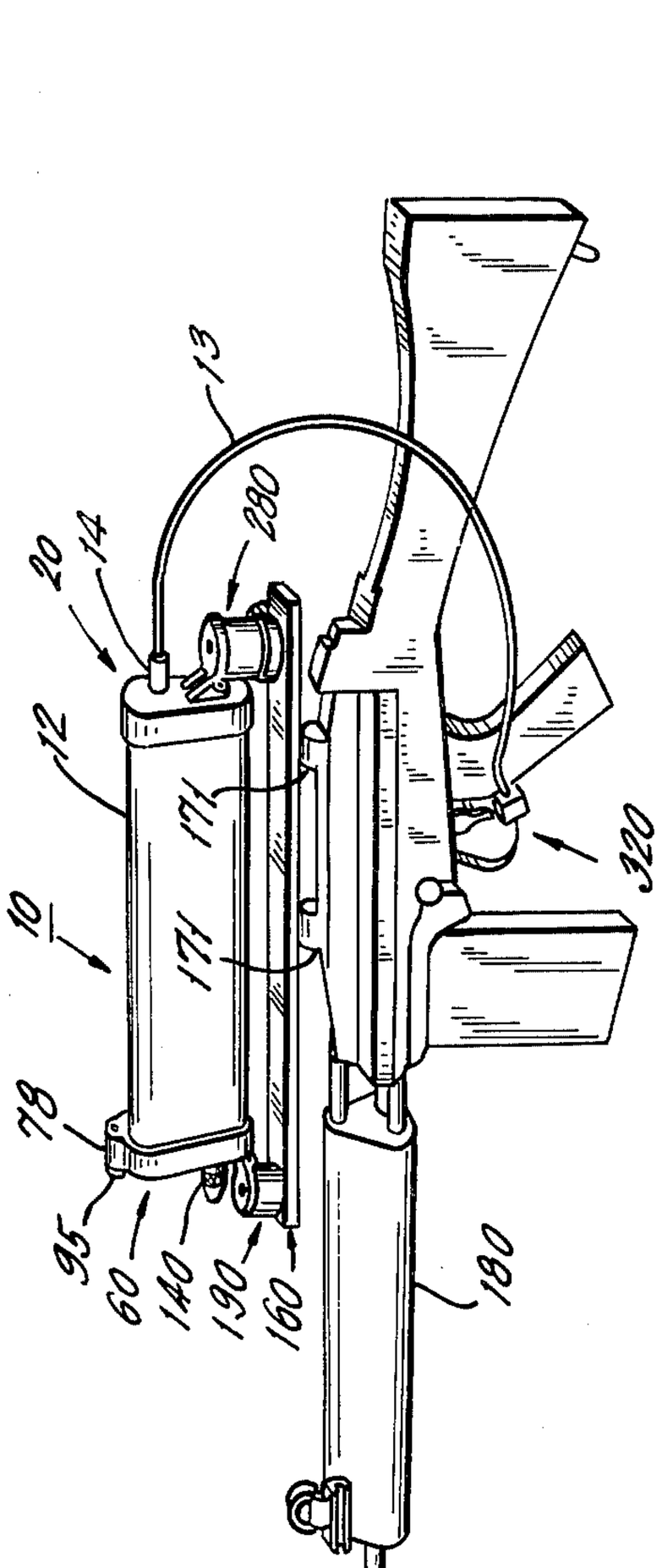
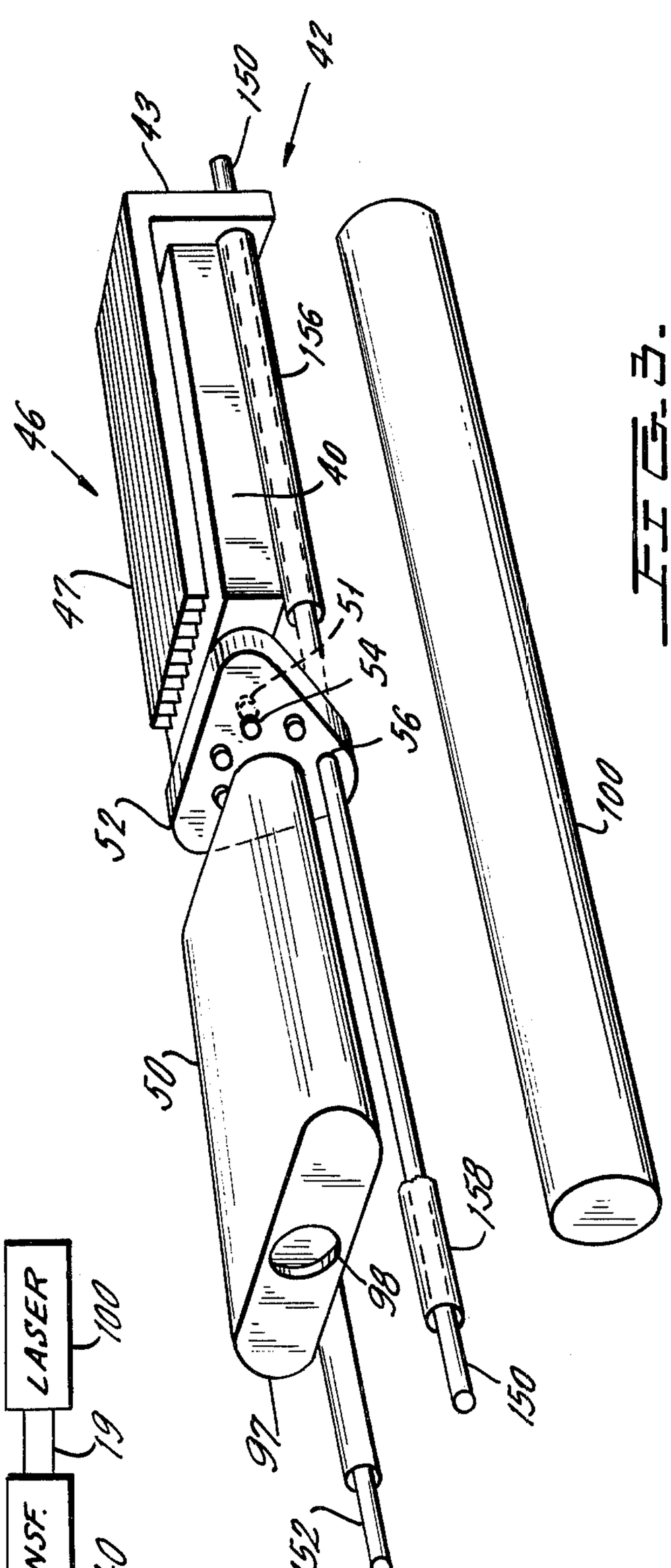


FIG. 1.



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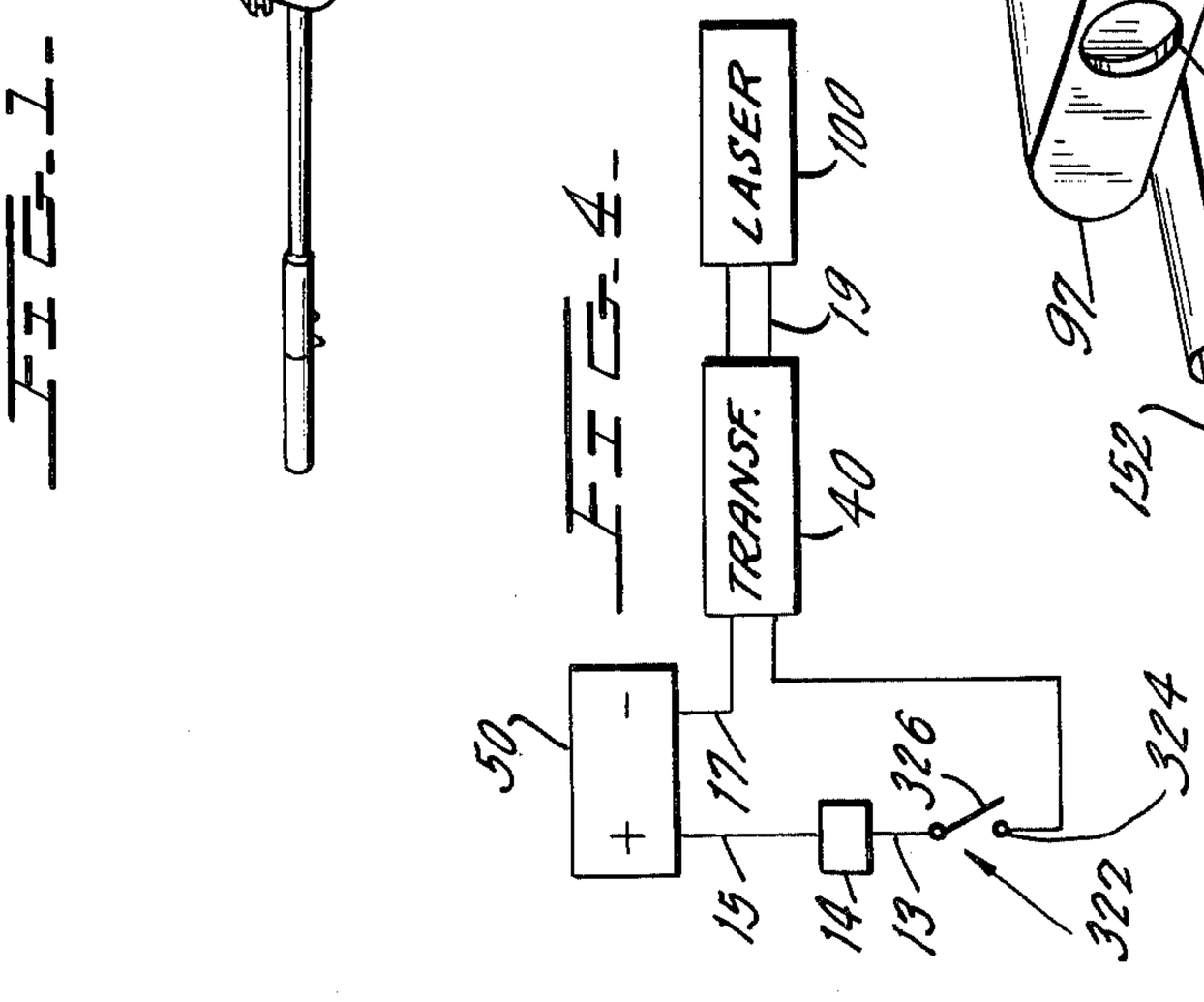

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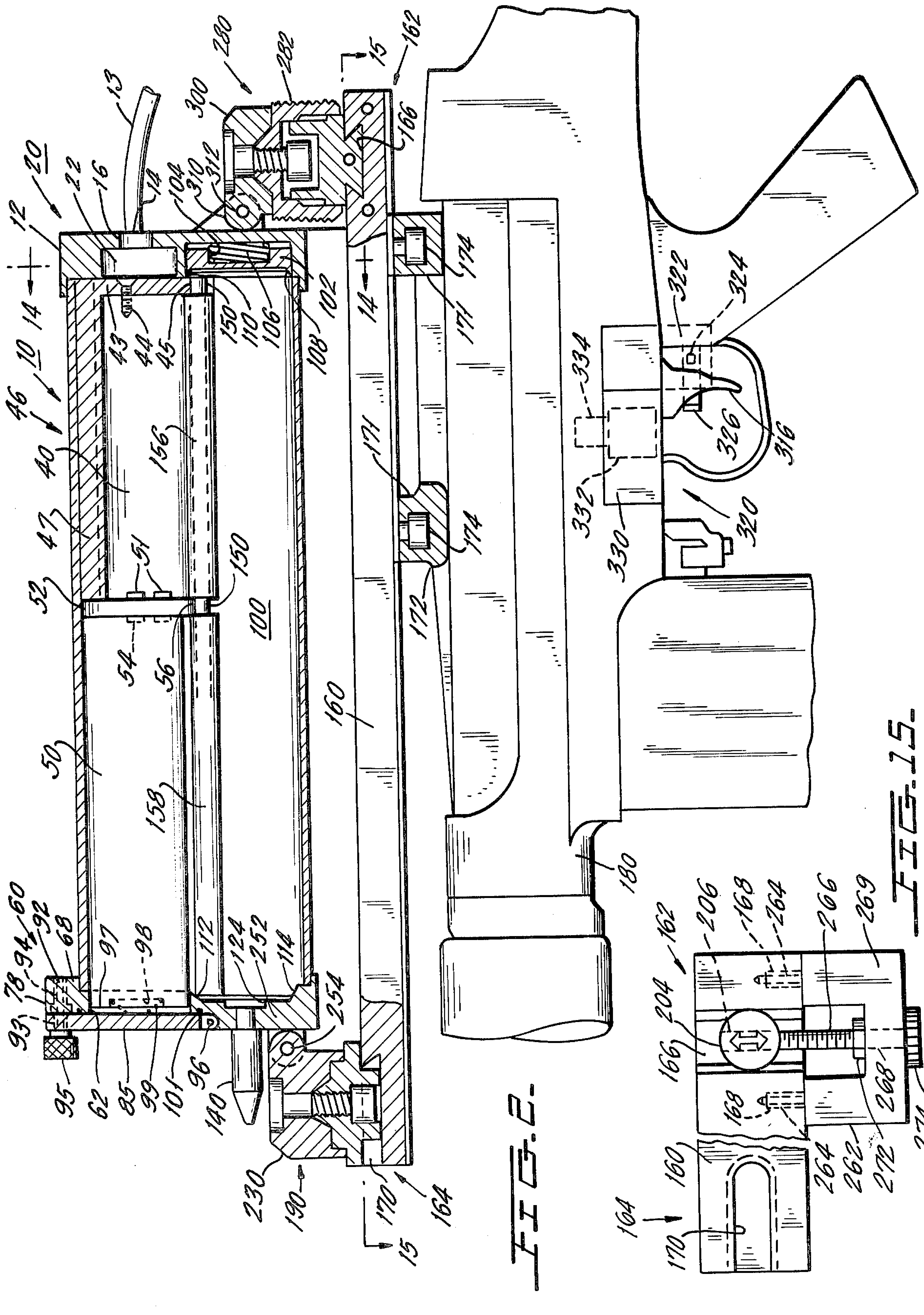
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FIG. 2.

FIG. 15.

FIG. 7.

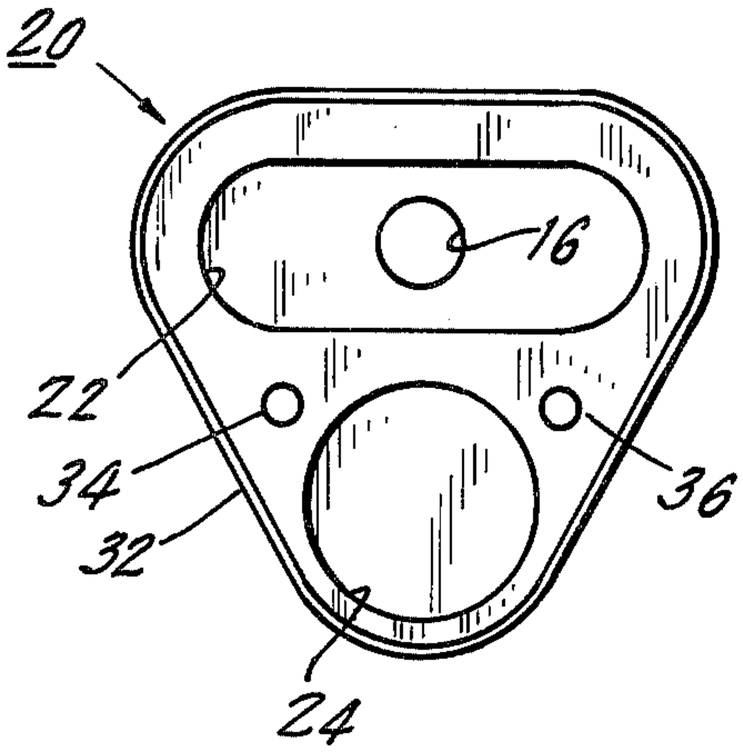


FIG. 6.

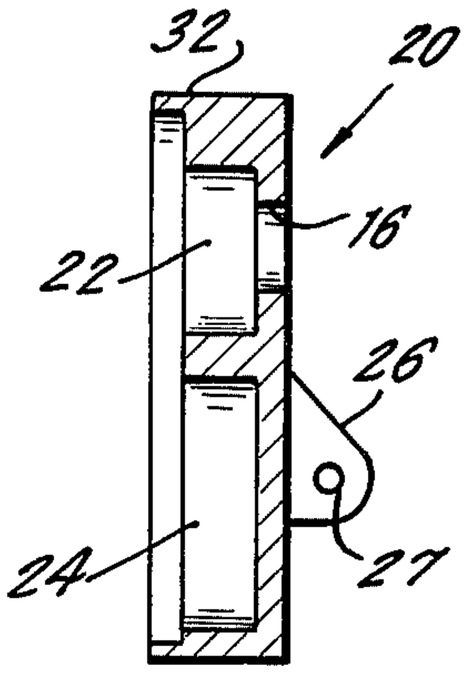


FIG. 5.

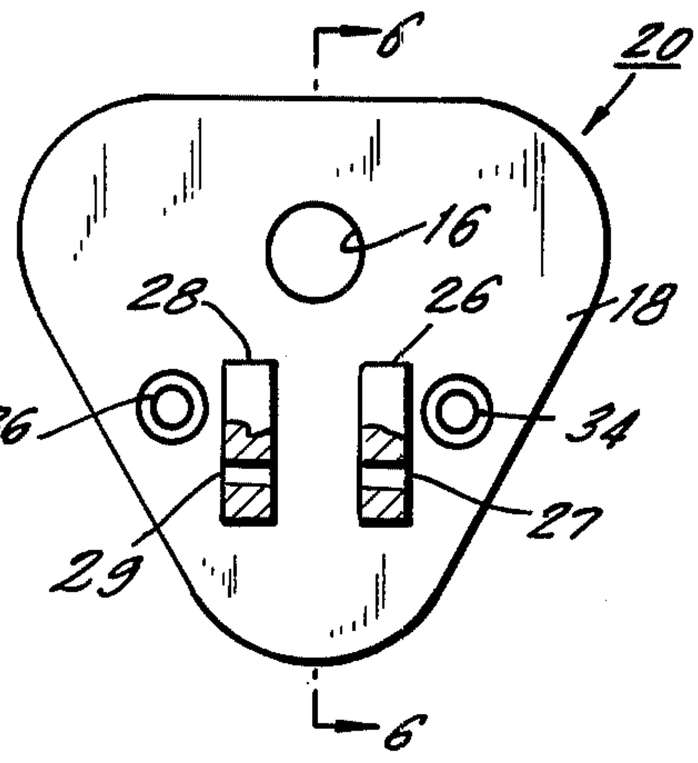


FIG. 8.

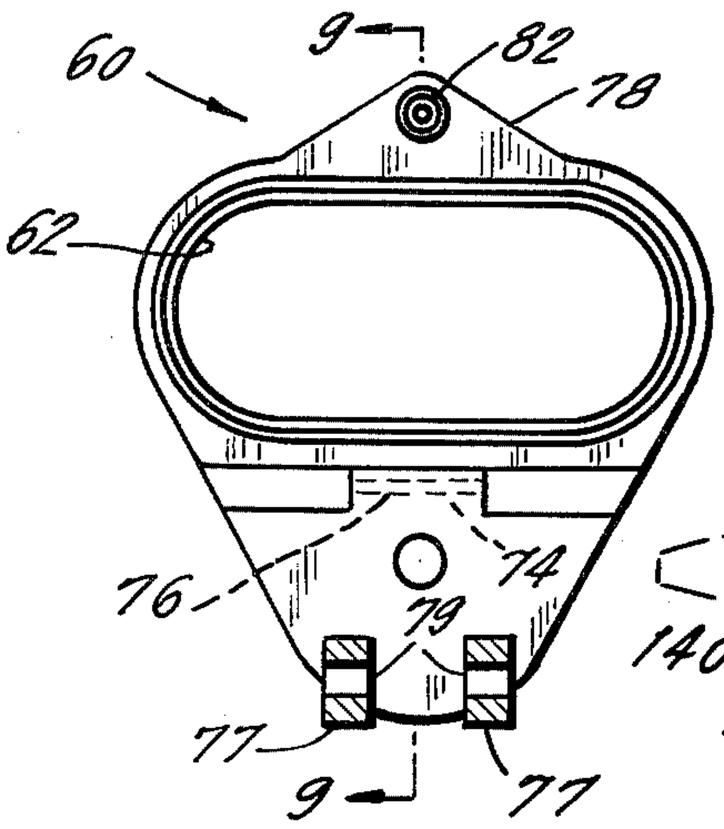


FIG. 9.

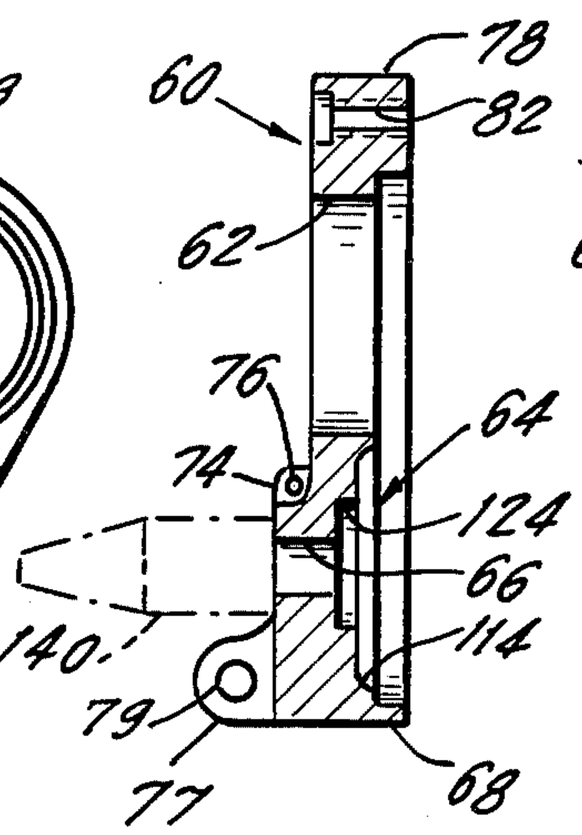
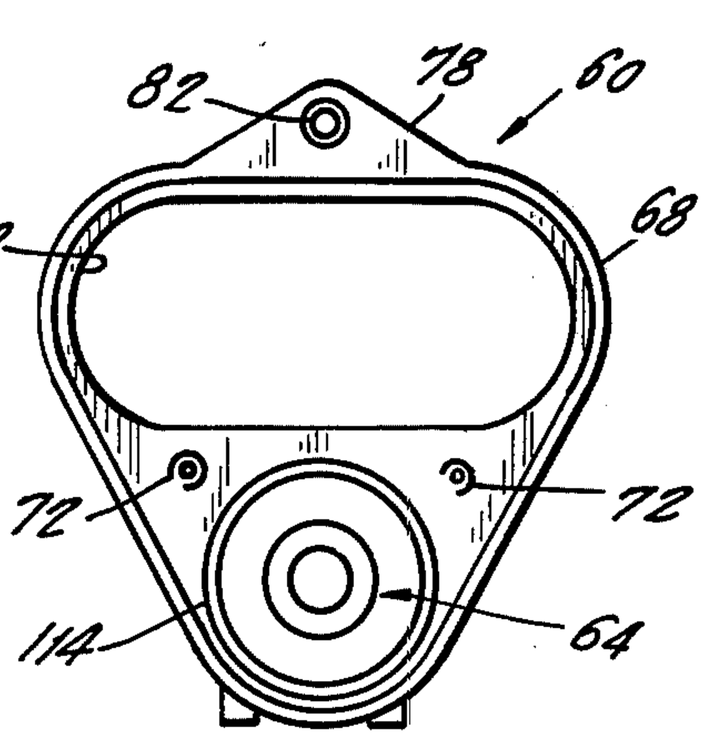


FIG. 10.



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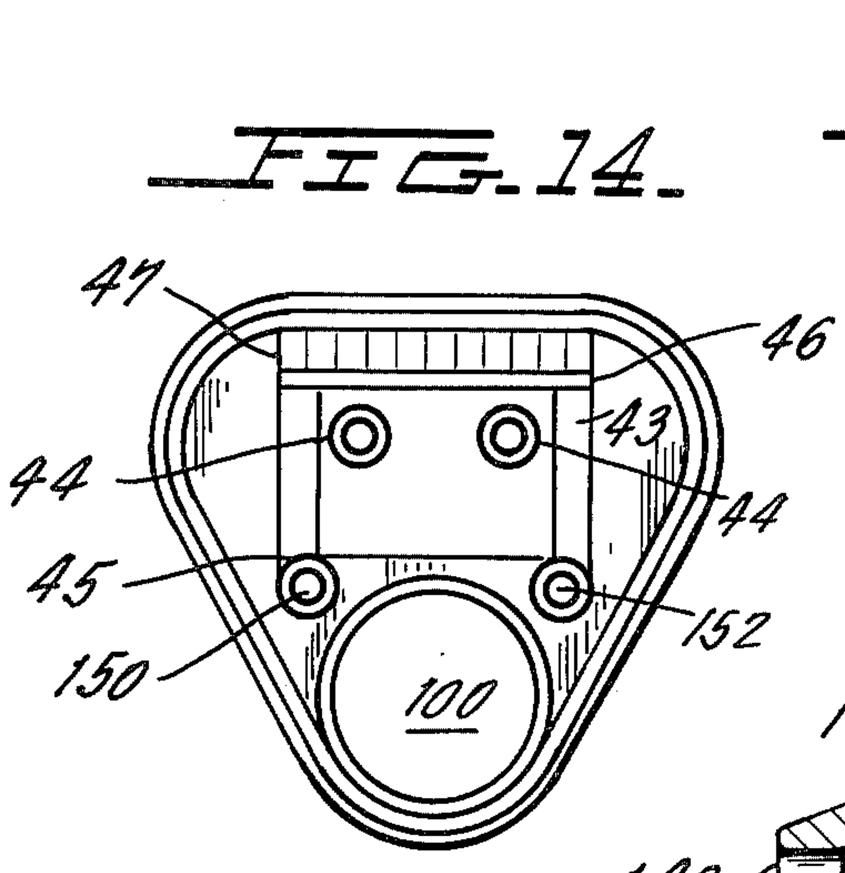

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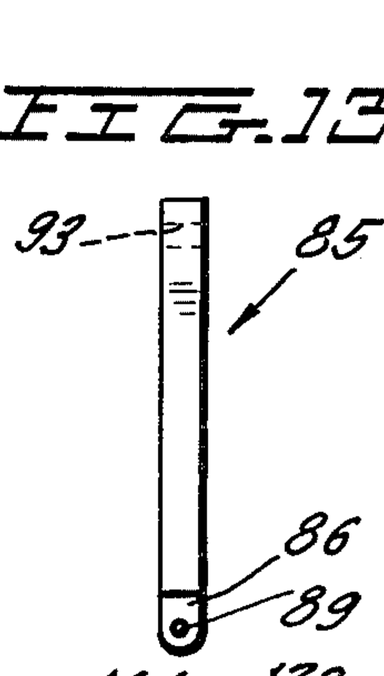

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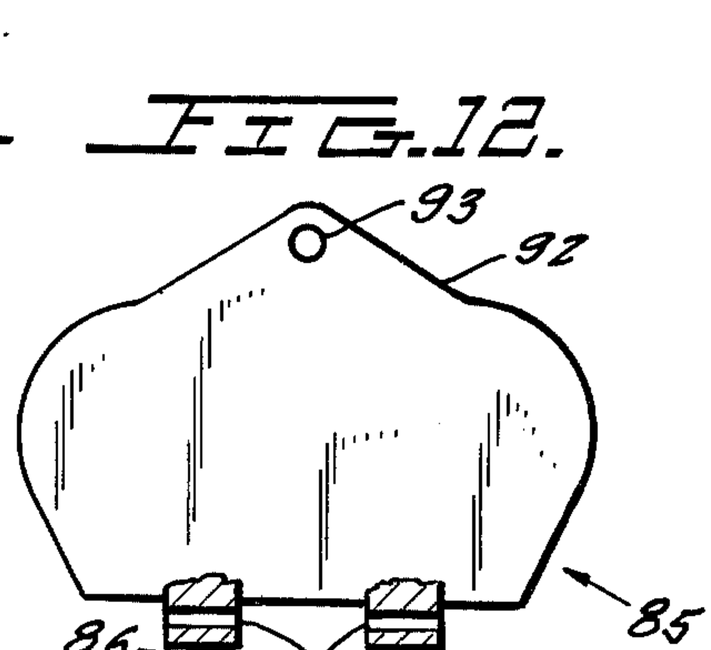


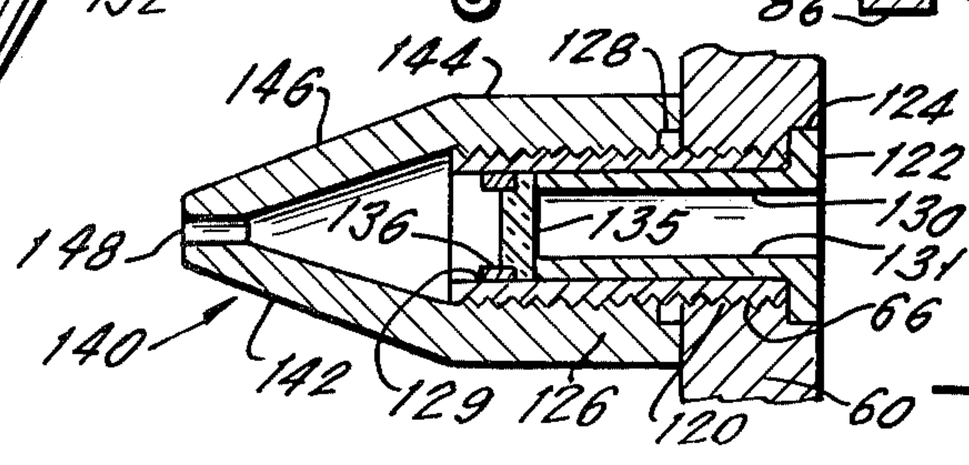
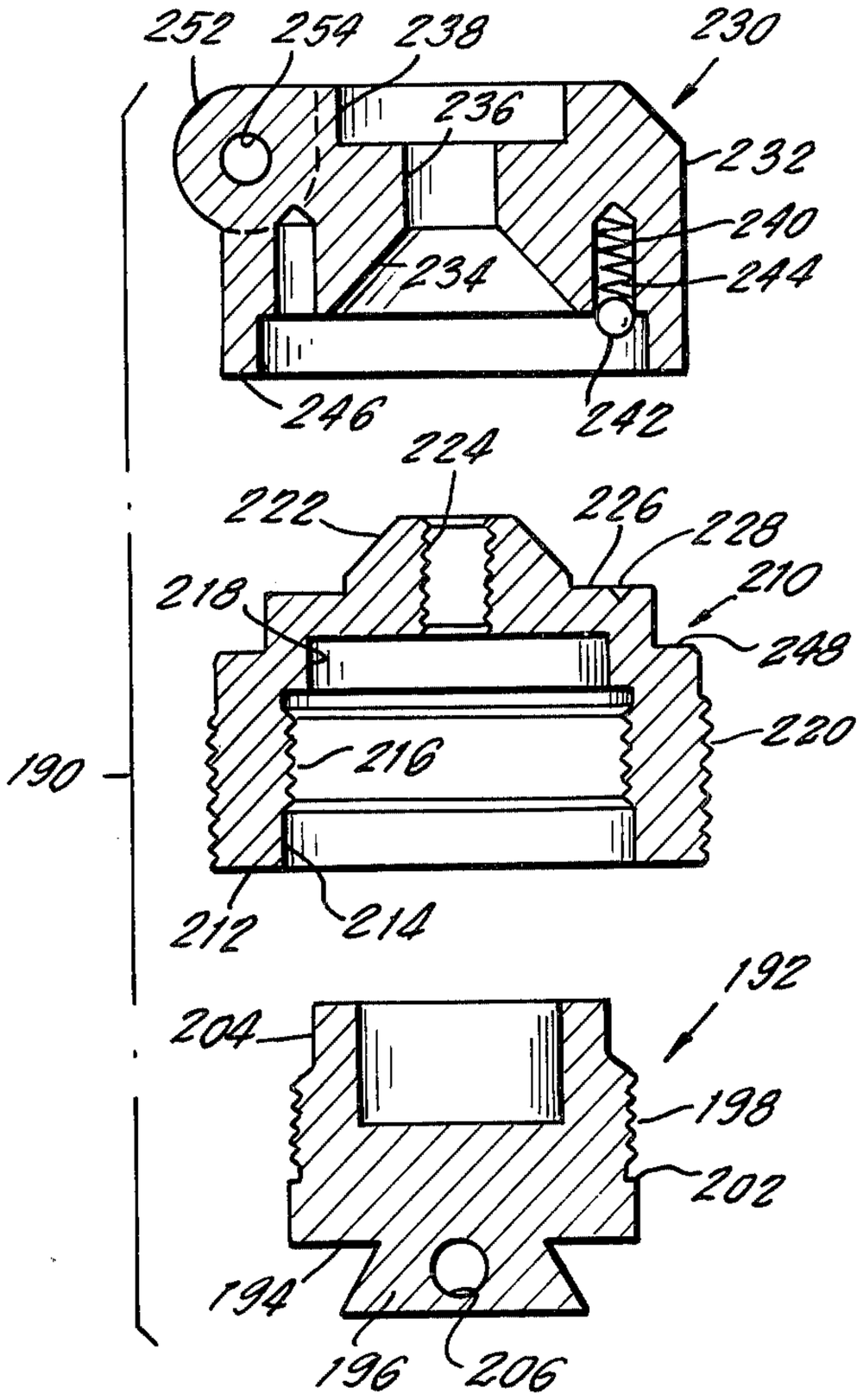


FIG. 11.

FIG. 16.



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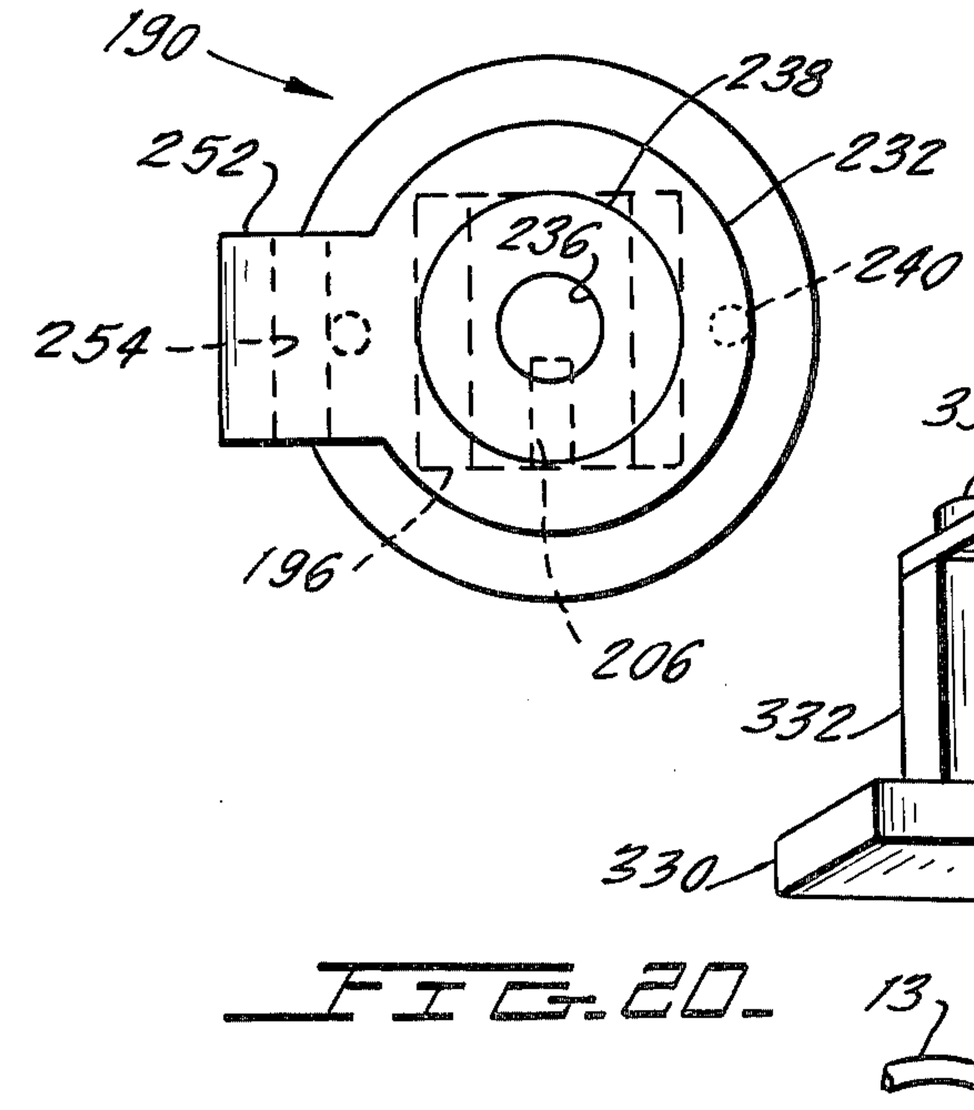

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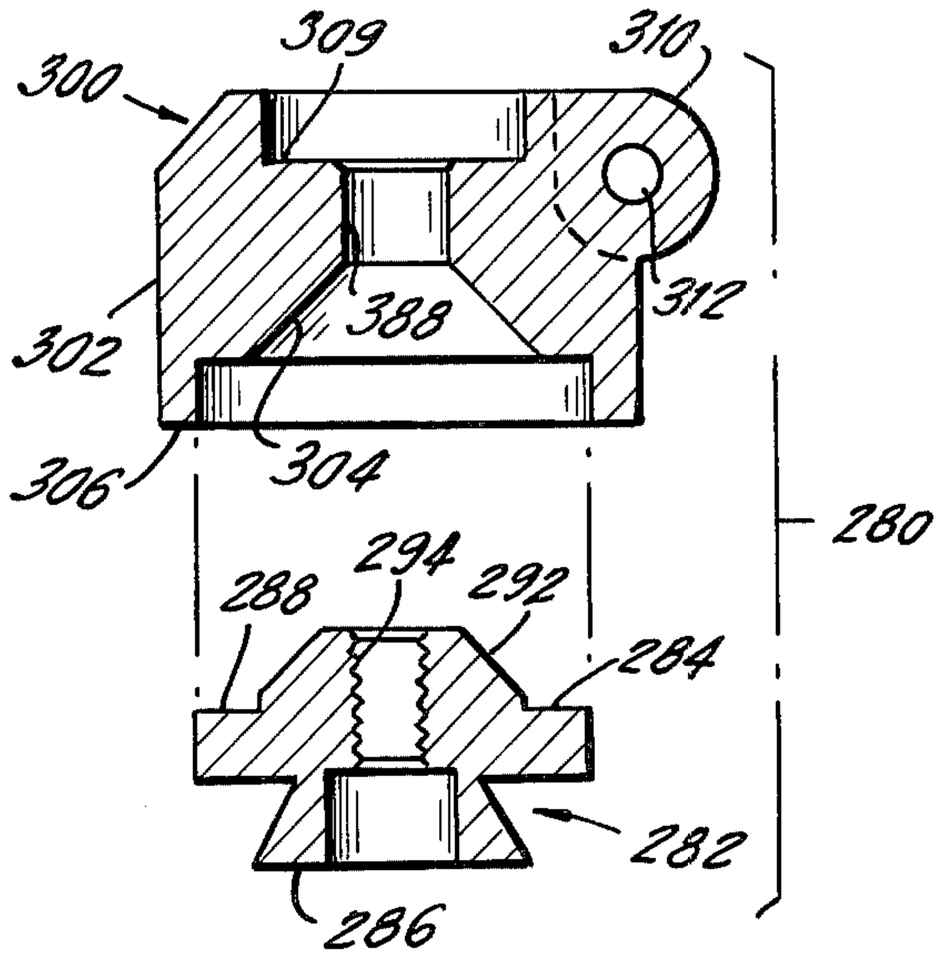

FIG. 19.

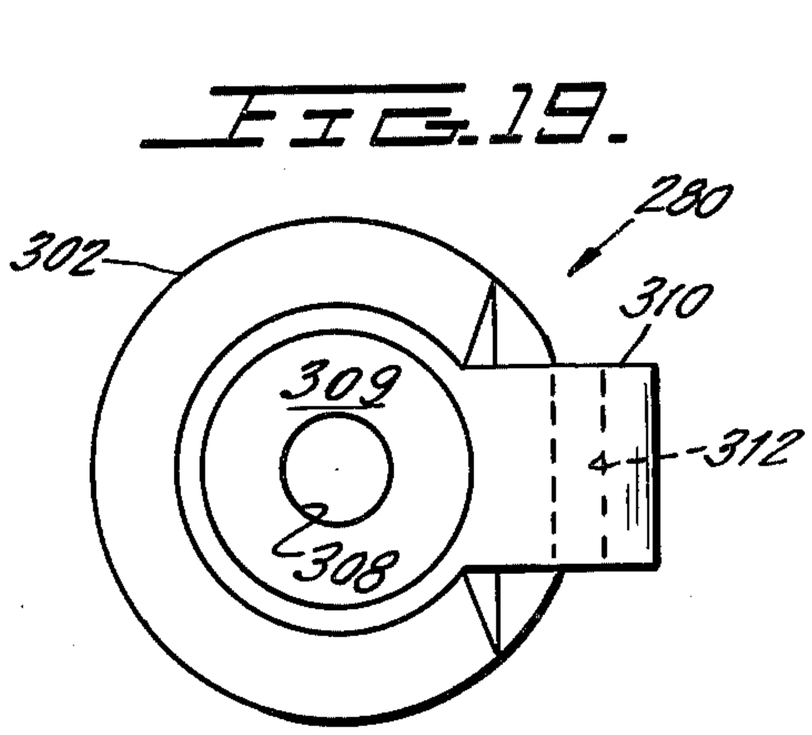

FIG. 21.

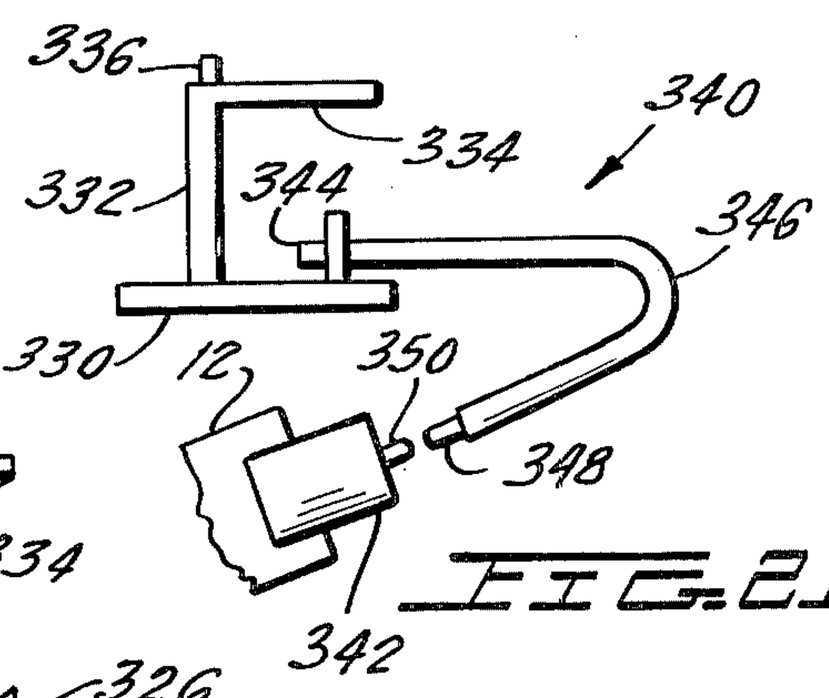

FIG. 20.

LASER AIMING DEVICE FOR WEAPONS

BACKGROUND OF THE INVENTION AND DESCRIPTION OF THE PRIOR ART

The present invention relates to an aiming device for any weapon that fires a projectile at a target which is in the line of sight from the weapon. In particular, the invention relates to a laser aiming device which shines a laser beam on the target and enables a marksman to preview the area of anticipated impact of the projectile.

Aiming a weapon is often difficult. The target sighting device, i.e. gunsight of the weapon must be placed at the marksman's eye, and especially with hand held weapons, such as rifles, or the like, this may not be a comfortable or steady position for holding or firing the weapon. Further, the usual procedures of sighting on a target and the designs of standard sighting devices greatly restrict the marksman's field of view of the target, and, on occasion, time must be spent to locate the target in the sighting device. Additionally, a marksman may have to close one eye to adequately sight on the target, greatly restricting his field of view and rendering him unable to know about events taking place in his immediate vicinity. Conventional aiming devices do not permit the marksman or operator of the weapon to preview precisely the impact area of the weapon. They only permit the marksman to visualize the general field of the target. Thus, aiming efficiency is relatively low. Aiming efficiency will only improve with the help of specialized equipment, such as radar, which requires additional experienced personnel for its operation. Further still, weapons often must be fired under poor visibility conditions, e.g. at night, at obscure targets and under unfavorable weather conditions. Additionally, great speed of aiming and ease of aiming are both hard to attain with conventional aiming devices.

Conventional weapon aiming devices are either optical and use front and rear sights, or they are infrared, or they are optical and mechanical or electromechanical as in larger guns, like tank guns, or they are electronic as used with non-manually controlled weapons such as antiaircraft weapons, particularly those controlled by radar. Each of the various conventional techniques of aiming a weapon has at least some of the above described drawbacks.

One technique for overcoming the foregoing difficulties encountered in aiming a weapon is to project a laser beam or other appropriate light beam onto the target. When the target is illuminated by the laser or light beam, the trigger of the weapon is operated. If the laser or other light beam is properly zeroed in on the aiming point of the weapon, the projectile fired by the weapon will strike where the light is shining.

One previously tried application of this technique consists of nonmovably affixing a laser tube to the barrel of a rifle. The laser beam is initially zeroed on the aiming point of the rifle. Once the laser beam has been aimed, its aiming point cannot be readjusted. The operating mechanism for activating the laser is located away from the trigger of the weapon. After the marksman has shown the laser beam to aim the weapon, the marksman then moves his hand to and operates the trigger of the weapon. The foregoing device has proven unacceptable because the unadjustably aimed laser beam has not always shown precisely on the target. This is due in part to the shocks to which a weapon is exposed in use which may shift the aiming point of the laser beam.

Further, when the marksman moves his hand from the laser operating mechanism to the weapon trigger, he sometimes throws the aiming point of the weapon off the target area.

SUMMARY OF THE INVENTION

The present invention is an improved laser aiming device which seeks to overcome the above described drawbacks of prior art aiming devices and of the known form of laser aiming device.

The invention offers a relatively small weapon aiming device that can be easily carried on any hand held weapon and which requires virtually no training or experience to operate. The device permits a marksman to visualize the target and the precise impact zone of the projectile using both eyes, which is the way the marksman is used to seeing objects.

The laser aiming device according to the invention comprises a mounting support which is fixedly attached to the weapon. The rest of the laser aiming device is attached to its mounting support. The aiming device includes zeroing means connected between the mounting support and the rest of the device and which enable the aiming point of the laser beam to be readjusted up and down or sideways after the aiming device is mounted on a weapon. Further, should subsequent rezeroing of the aiming device become necessary, due, for example, to slight shifting of the aiming device with respect to the weapon, the zeroing means between the laser and its mount permit the aiming device to be rezeroed.

The operating lever for the laser is placed so that as the trigger of the weapon is first operated, the laser operating lever is simultaneously moved and the laser beam shines. The weapon is then aimed so that the target is illuminated. Then the marksman continues moving the trigger of the weapon to fire the projectile. Thus, the same trigger stroke that eventually fires the weapon initially aims it.

In the laser aiming device of the present invention, when the laser is operated, a laser beam is projected toward the target. The laser beam is normally invisible. But, when it strikes the target, it forms a visible dot on the target. When the marksman has moved the weapon so that the visible dot is over the target, he completes operating the trigger of the weapon. If the laser beam has been properly zeroed in with the weapon, the projectile fired from the weapon should impact on the illuminated target. Another benefit of a laser aiming device is that once the device has been zeroed at one range, it is automatically zeroed for all ranges.

One major problem with a laser aiming device is to ensure that the laser light source remains level within the housing of the aiming device so that the laser beam will reliably exit through a very small outlet opening at the front end of the housing. If the laser becomes even slightly misaligned, the radiating light will be lost inside the housing and will not exit through the outlet. A further problem is to ensure that the laser and the entire aiming device are not misaligned due to weapon recoil, shocks in handling or other ambient conditions. In accordance with the invention, the laser is securely anchored in the aiming device and the aiming device securely holds the laser to prevent its undesired shifting.

A laser aiming device according to the invention has been effectively tested at ranges up to 4 km., and a weapon including this device has been accurately fired at a range of approximately 1,000 yards.

Although a projectile fired by a weapon usually has a generally parabolic, ballistic trajectory, nonetheless the projectile should always hit the target within the area illuminated by the laser beam. A laser beam is a luminous coherent monochromatic, collimated light ray. Such a ray has a diffraction factor of approximately 1.6 milliradians. This degree of diffraction assures the aiming device of the invention will always be accurate. For example, under normal atmospheric conditions, at a distance of 100 m. between the laser and the target, the diameter of the illuminated dot on a flat target that is perpendicular to the laser beam is approximately 10 cm. At this 100 m. distance, the projectile, e.g. a bullet from a rifle, will strike the target precisely at the middle of the circle of illumination. At a 300 m. distance, the circle of illumination will have a diameter of approximately 30 cm. At this same distance, the projectile will strike the target slightly below the middle of, but definitely within the circle of illumination. At 50 m. distance, the circle of illumination will have a diameter of 5 cm., and the projectile will strike within the circle of illumination, but slightly above its middle.

Accordingly, it is the primary object of the present invention to provide an aiming device for a weapon.

It is another object of the present invention to provide such an aiming device which has the benefits described above and which avoids the drawbacks of the prior art described above.

It is a further object of the invention to provide such an aiming device which uses a laser.

It is another object of the invention to provide a laser aiming device which can be zeroed and rezeroed on the aiming point of the weapon.

It is a further object of the invention to provide such an aiming device which does not require the marksman to perform a special operation just before firing the weapon to activate the aiming device.

It is yet another object of the invention to provide such an aiming device which is operated as the trigger of the weapon is operated.

The foregoing description of the invention and the foregoing and other objects of the invention will be further explained in the following detailed description of a preferred embodiment of the invention, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a rifle fitted with an aiming device according to the present invention;

FIG. **2** is a cross-sectional elevational view of an aiming device according to the invention;

FIG. **3** is an exploded perspective view of some of the components of the aiming device, showing their relationship;

FIG. **4** is a schematic circuit diagram showing the interconnection of the elements of the aiming device according to the invention;

FIG. **5** is an outside elevational view of the rear plate of the housing of the aiming device;

FIG. **6** is a cross-sectional side elevational view of the rear plate along the line **6—6** of FIG. **5**;

FIG. **7** is an inside elevational view of the rear plate;

FIG. **8** is an outside elevational view of the front plate of the housing of the aiming device;

FIG. **9** is a cross-sectional side elevational view of the front plate along the line **9—9** of FIG. **8**;

FIG. **10** is an inside elevational view of the front plate;

FIG. **11** is a cross-sectional side view of an outlet nozzle from the aiming device;

FIG. **12** is an end elevational view of a door over the front end of the housing of the aiming device;

FIG. **13** is a side view of the door of FIG. **12**;

FIG. **14** is an elevational view just inside the rear plate, showing some components of the aiming device and along the line **14—14** of FIG. **1**;

FIG. **15** is a top view of the mounting bar of FIG. **14** and showing transverse moving means for the aiming device;

FIG. **16** is an exploded, cross-sectional, side elevational view of the rear mount for the aiming device on its mounting bar;

FIG. **17** is a top view of the rear mount of FIG. **16**;

FIG. **18** is an exploded, cross-sectional, side elevational view of the front mount for the aiming device on its mounting bar;

FIG. **19** is a top view of the front mount of FIG. **18**.

FIG. **20** is a perspective view of one weapon trigger actuated operator of a laser aiming device; and

FIG. **21** is a diagrammatic view of a second embodiment of such an operator.

DESCRIPTION OF A PREFERRED EMBODIMENT

One embodiment of a laser aiming device according to the invention is now described.

The aiming device **10** is activated by an operator **320** described below, which acts through a cable **13**, described below. The cable **13** leads to the housing **12** of the laser aiming device **10**, and the cable is received in the plug **14** at the rear end of the casing **12**.

Turning to the schematic circuit of FIG. **4**, the plug **14** is connected by a cable **15** into the below described battery **50**. The battery **50** is connected by a cable **17** into the transformer **40**. The transformer is electrically connected by appropriate cables **19** to the laser lamp or light source **100**.

The plug **14** passes through the opening **16** in the rear wall **18** of the rear end plate **20** shown in FIGS. **5–7**. The opening **16** and the plug **14** passing therethrough are sealed so that water, moisture, dirt and other contaminants cannot enter the housing **10**.

The casing **12** has a uniform, generally triangular, vertical cross-sectional shape, with rounded apices. The casing **12** is normally oriented with one of its apices aimed downwardly and with the laser tube **100** being positioned near the bottom of the casing. The casing is an integral tube, and its material is rigid and strong so as not to be damaged through normal use.

The rigid rear plate **20** of FIGS. **5–7** includes the upper cable housing **22** for storing cable connections between the laser tube **100** and the transformer **40** and between the plug **14** and the battery **50**. The rear plate **20** also has a lower circular chamber **24** for receiving the rear support block **102** for the laser tube **100**.

On the rear, outside of the rear plate **20**, there are a pair of mounting flanges **26, 28** which receive the mounting flange **252** of the rear mount **190** for the casing **12**. Each flange **26, 28** has a respective aligned opening **29** therethrough for receiving a fastening pin, screw, or the like that holds the end plate **20** on the below described mount **190**.

The rear plate **20** has a forwardly projecting peripheral lip **32**, which seals around the exterior of the rear end of the casing **12** to seal out moisture and contaminants.

The rear plate **20** also has the openings **34, 36,** therethrough, which receive the end plate fastening bolts **150, 152.**

The transformer **40** is supported forward of the rear plate **20** by support means described below. The transformer is electrically connected by cables **17** with the conventional electric battery **50** that is located forward of the transformer **40** in the casing **12.** For example, the battery is an 12.2 ± 2.4 VDC, 2.8 ampere battery. The transformer transforms the voltage to 1500 ± 50 volts.

A generally L-shaped transformer support and heat radiator assembly **42,** shown in FIGS. **2, 3** and **14,** includes the rear supporting plate **43** located behind the transformer **40** and against which the transformer **40** abuts. Screws **44** join the transformer **40** mechanically to the rear supporting plate **43.** The plate **43** is provided with the support bolt receiving holes **45** therethrough for receiving the bolts **150, 152.** These bolts hold the entire assembly **42** in place. The top leg **46** of the assembly **42** comprises a radiator **47** comprised of a plurality of parallel upstanding heat radiating vanes. During operation, the transformer **40** generates considerable heat which is conducted to vanes **47** and is radiated into the interior of the casing **12** by the vanes.

A partition **52** is positioned between the transformer **40** and the battery **50.** The rear (right-hand) surface of the partition **52** is provided with contacts **51** which engage cooperating electric contacts on the transformer. The front surface of the partition **52,** facing the battery **50,** carries a plurality of contacts **54** for engaging the cooperating battery contacts. The contacts **51, 54** on the partition **52** enable the battery and the transformer to be electrically connected and cause these elements to be mechanically aligned in the casing. The partition **52** also is affixed in position on the bolts **150, 152.** Holes **56** pass through the partition **52** for receiving these bolts.

At the forward side of the battery, the casing **12** is sealed closed by the rigid front plate **60,** shown in FIGS. **9–11.** The front plate **60** has an upper, large width, round end opening **62** passing through it, through which the battery **50** may be inserted into and removed from the casing **12.** The lower, rearwardly facing, inward side of the front end plate **60** is provided with a stepped, tapering opening **64,** detailed further below, for positioning the front end of the laser tube **100** and the laser beam outlet nozzle **140.** A narrower width light passage opening **66** is provided in the plate **60** through which the laser light enters the outlet nozzle. On its rearwardly or inwardly facing side, the plate **60** has an annular peripheral, rearwardly extending rim **68,** which passes around the casing **12** and seals the front plate **60** against the casing to exclude moisture and contaminants.

At its rearwardly facing side shown in FIG. **10,** the plate **60** has tapped, threaded, bolt receiving openings **72** for receiving the free, forward ends of the bolts **150, 152.** Tightening of these bolts draws both the front plate **60** and the rear plate **20** against the casing **12,** thereby securely sealing the casing between the end plates.

The front plate **60** has the forwardly projecting mounting tabs **77** thereon with aligned holes **79** therethrough for receiving a mounting pin that cooperates with the mounting flange **310** of the below described front mount **280,** for mounting the front end of aiming device **10** to the support bar **160,** as described below.

The front plate **60** is also provided with a battery opening door hinge mount **74** through which a hinge pin receiving opening **76** passes. The flange **78** projecting above the top of the plate **60** includes the threaded opening **82** therein for receiving the door locking bolt **96.**

Referring to FIGS. **12** and **13,** the door **85** is of a size adequate to cover all of the battery opening **62** on the open, forward side of the front plate **60** and it has a peripheral shape, especially where it meets the periphery of the plate **60,** such that it does not project beyond the periphery of the plate **60.** The door includes the downwardly projecting hinge mount tabs **86, 88,** having the hinge pin receiving openings **89.** The door also has an upwardly extending flange **92,** which is shaped to the shape of the flange **78** of the forward plate **60.** The flange **92** includes an opening **93** therethrough for receiving the shaft of the door securing bolt **94,** and the opening **93** is smaller than the head **95** of that bolt, so that the bolt **94** may be passed through the opening **93** and tightened into the threaded receiving hole **82** in the front end plate flange **78.** The knurls on the periphery of the bolt head **95** permit it to be manually removed in the field for battery replacement. The hinge pin **96** passes through the aligned openings **76, 89** for hinging the door **85** to be opened and shut for insertion and removal of the battery **50.**

The bottom (left) side **97** of the battery, which does not have electric contacts on it, has a depression **98** for receiving the compression spring **99** that urges the battery securely against the partition **52** when the door **85** is closed. The spring is attached on the bottom of the battery, whereby when the door **85** is open, the spring will not fall away. The battery **50** holds the partition **52** securely against the contacts of the transformer **40,** effecting electric contact along the entire series of elements. Should the aiming device **10** be jolted or shocked during normal use of the weapon to which the aiming device is attached, the spring **99** ensures continued electric contact and proper placement of the elements affected by the bias of the spring **99.**

An O-ring **101** seals the battery enclosure in the casing **12** when the door **85** is closed.

The laser tube **100** is located in the casing **12** beneath both the transformer **40** and the battery **50** and is oriented parallel to them. The laser **100** is a standard helium-neon laser operating at 2 milliwatt. The laser is oriented such that its light is directed to the front of the casing **12.** By cables **19,** the transformer is connected to and operates the laser (see FIG. **4**).

The laser is mechanically held within the casing **12** between the rear plate **20** and the front plate **60** which enclose the casing. Positioned inside the circular chamber **24** of the rear plate **20** and correspondingly shaped around its periphery to the interior periphery of the chamber **24** is the laser tube positioning support block **102** which is of a length enabling it to be axially shifted through the chamber **24.** The rear side of the support block **102** has a receiving opening **104** for receiving the normally charged compression spring **106.** The spring **106** extends between the rear side of the support block **102** and the front side of the rear plate **20** inside the chamber **24.** The front side of the support block **102** is contoured with an annular taper and/or chamfer having at least one tapered step **108** for receiving a corresponding annular chamfer or taper on the rear end of the laser tube **100.** The laser tube **100** is correspondingly annularly tapered or chamfered on its rear edge at **110** for cooperatingly mating with the chamfered surface **108.** This mating arrangement, when the tapering surfaces

108, 110 are in engagement, and with the rear support block 102 secured against sideward motion in the chamber 24, anchors the rear end of the laser tube 100 against moving laterally across the casing 12 and it also biases the laser tube normally forwardly toward the front plate 60. Further, in the event the aiming device 10 is jolted in use, shifting of the laser is absorbed by the spring 106.

The front end of the laser tube 100 is also provided with an annular chamfered surface 112, by which the laser tube is supported. Referring to FIGS. 9 and 10, the opening 64 in the rearwardly facing side of the front plate 60 is provided with a cooperatingly chamfered annular surface 114, against which the laser tube surface 112 is securely seated. The above described securement of the laser tube ensures that the light exiting from the laser tube is properly aimed toward the target.

As noted above, the narrowed width light outlet 66 through the front plate 60 passes the light exiting from the laser tube. Located inside the opening 66 are two concentric tubes. The external tube 120 has an interior flange 122 that seats in the undercut opening 124 at the inside of the front end plate 60. The exterior 126 of the tube 120 extending forwardly of the plate 60 is screw threaded.

A matingly threaded nut 128 is tightened over the threaded exterior surface 126 against the plate 60 and cooperates with the flange 122 to hold the tube 120 securely in place. Projecting inwardly from the inside of the tube 120 near its forward end is an annular rib 129 for holding the sealing lens 135 in place.

The interior of the tube 120 is screw threaded at 131 for receiving the internal tube 130. The internal tube 130 has an external diameter corresponding to the internal diameter of the external tube 120, and the internal tube 130 is correspondingly screw threaded to the screw threads 131 on the interior of the tube 120. The interior tube 130 is screwed into the exterior tube 120 from the right as viewed in FIG. 9. The tube 130 is screwed tightly enough to hold the sealing lens 135 between the forward annular edge of the internal tube 130 and the rearwardly facing edge of the annular rib 129.

The sealing lens 135 between the tube 130 and the rib 129 is a flat, plain, transparent plate comprised of a quite hard material, e.g. an artificial ruby comprised of corindon, or the like. The lens is securely held in place and seals the passageway leading toward the laser tube, whereby the laser is sealed at its outlet side against moisture, contaminants or the like. An O-ring 136 is interposed between the rib 129 and the lens 135 for ensuring that seal.

A hollow nozzle 140 extends from the tube 120 and defines the outlet for light from the laser. The nozzle 140 includes the tube 142 which is screw threaded at the interior of its rear portion 144 and is sized to mate with the screw thread 126 on the exterior of the tube 120, such that the tube 142 may be tightened up against and supported against the front side of the plate 60. At its interior 146, the tube 142 gradually tapers narrower conically, moving forwardly of the lens 135, until it is narrowed to a small outlet hole 148. At the outlet from the laser tube 100, the laser beam has a width of 0.5 mm. At the outlet 148, the opening is a relatively larger 1 mm. The length and narrowing of the nozzle 140 ensures unidirectional radiation without stray radiation. The interior surface of the tapered opening 146 is painted or otherwise darkened black so as to be nonreflective. The purpose of the nozzle 140 and particularly of its darkened interior 146, is to prevent stray radiation from projecting off to the sides of the aiming device, which could blind or interfere with the vision of the marksman and of those operating at his side.

Referring to FIGS. 2, 3, 5, 7 and 10, a pair of elongated bolts 150, 152 extend across the entire length of the casing 12, with the bolt 150 extending through the hole 36 in the plate 20, through the hole 45 in the wall 43, through the hole 56 in the partition 52 and into the aligned hole 72 in the front end plate 60. The hole 72 is screw threaded to receive the bolt 150, such that tightening of the bolt 150 draws its head against the outside, rearwardly facing side of the plate 20 and pulls the plate 60 toward the plate 20. Similarly, the bolt 152 passes through the hole 34 in the plate 20, through the aligned holes in the intermediate elements and into the other hole 72 in the plate 60. The tightening of the bolts 150, 152 securely holds the end plates together and holds the entire casing 12 and the elements therein together.

There are positioned over the bolts 150, 152 identical sets of freely movable spacer sleeves. Over bolt 150, spacer sleeve 156 is interposed between the transformer support wall 43 and the partition 52 and spacer sleeve 158 is interposed between the partition 52 and the front plate 60. The lengths of the sleeves 156, 158 are selected to ensure that the elements resting against them, and particularly the partition 52, are properly placed when the bolts 150, 152 are tightened and to ensure that all of the elements of the aiming device, and particularly the transformer 40 and battery 50 have uniform, predictable pressure applied to them.

For mounting the above described aiming device on a weapon, such as the rifle 180, a mounting assembly is provided. It includes the mounting bar 160 of FIGS. 1 and 15, the front mount of FIGS. 18 and 19, and the rear mount of FIGS. 16 and 17.

Referring to FIGS. 1, 2 and 15, the weapon mount for the aiming device includes the elongated mounting bar 160 which is oriented along the length of the weapon. The bar has the rear mounting formation 162 away from the muzzle of the weapon and the forward mounting formation 164 closer to the muzzle of the weapon. The rear formation 162 comprises a dovetail shaped groove 166, which extends laterally across the bar 160. By mechanisms to be described below, the dovetail groove 166 permits adjustment of the aiming point of the laser 100 sideways with respect to the weapon on which the mounting bar 160 is secured. The rear formation 162 further comprises the threaded screw receiving holes 168, by which the rear mount 190 of the aiming device is attached to the bar 160.

At the front end of the bar 160, the formation 164 comprises the elongated, dovetail shaped groove 170, whose direction of elongation permits the front mount 280 to be inserted in the groove 170 from the front end of the bar 160. Once the front mount 280 is inserted into the groove 170, the entire aiming device 10, and including the rear mount 190, is moved rearwardly with respect to the bar 160 sufficiently to align the rear mount 190 with the groove 166 in order that the rear mount 190 may be received in that groove. Once the rear mount 190 has been received in the groove 166, the front mount 280 is sufficiently back from the open front end of the front groove 170 as to preclude removal of the front mount from the groove.

The bar 160 is mounted on the standard gunsight receiving mount of a weapon 180, such as a rifle. The

underside of the bar **160** is fitted with standard gunsight mounting elements **171**. These mate with the gunsight mount **172** on the weapon. A screw **174**, or the like attachment element, extends between the gunsight mounting elements **171** beneath bar **160** and the mount **172** at the top of the weapon for fastening the bar **160** securely to the weapon, in the same manner as any sight may be fastened thereto. The gunsight mounting elements on bar **160** will be different in design and arrangement, depending upon the gunsight mount atop that type of weapon. For mounting the aiming device of the invention on different weapons, the only change that has to be made is in the mounting arrangement beneath the bar **160**.

The rear mount **190** for the aiming device **10** is shown in FIGS. **16** and **17**. The mount **190** has a bottom section **192**, which is comprised of the tubular body **194** with the dovetail shaped male attachment unit **196** depending beneath it. The male attachment unit **196** is cooperatingly shaped to be received in the dovetail shaped groove **166** near the rear end of the bar **160**. Partway along its axial length, the body **194** is screw threaded at **198** on its exterior for effecting raising and lowering of the aiming point of the laser beam by vertically expanding and retracting the rear mount, as described further below. Beneath the screw threaded section **198** is the abutment **202** which limits the extent to which the rear mount **190** may descend. The narrowed width upper spigot **204** of the mount **190** helps guide the relative motion of the elements of the rear mount **190**.

The screw threaded opening **206** passes at least part way through and along the length of the dovetail element **196** for receiving an aiming device horizontal position adjustment shaft **266**.

The intermediate section **210** of the mount **190** is the only part thereof that is rotatable. It includes the tubular body **212** having a bottom opening **214** therein for receiving the portions **198, 204** of the bottom section **192** of the mount **190**. The opening **214** includes the internally screw threaded section **216** which is cooperatingly, matingly threaded to the threaded section **198**, such that with the threaded sections **198, 216** in engagement and as a result of rotation of the intermediate section body **212** with respect to the bottom section body **194**, the intermediate section **210** rises and descends with respect to the body **194** vertically expanding and retracting the rear mount. The section **218** of the opening **214** receives the spigot **204** of the bottom section **192** of the mount and this guides the vertical motion of the mount. The exterior of the body **212** is knurled at **220** for being manually grasped and rotated by a person zeroing in the aiming device, so as to rotate the body **212** with respect to the body **192** and thereby raise or lower the aiming point of the laser beam with respect to the aiming point of the weapon.

The upper portion of the intermediate section **210** has a conical taper **222** to be received in the cooperating opening **234** beneath the upper section of the mount **190**. A threaded screw hole **224** extends to the intermediate section **210** for receiving a fastening bolt that holds the top section to the intermediate section. Arrayed around the annular shelf **226** of the intermediate section **210** are a plurality of detent depressions **228** which cooperate with a detent means **242, 244** on the top section of the mount **190**, whereby the intermediate section **210** may be rotated to a series of discrete positions, with the arrival at each position being signaled by a click caused by the detent ball **242** snapping into one of the receiving depressions **228**.

The top section **230** of the rear mount **190** comprises the body **232** which has a conically tapered bottom opening **234** for receiving the cooperating conical taper **222** of the intermediate section **210** of the mount **190**.

A bolt receiving hole **236**, with a widened portion **238** for the head of a bolt (not shown) passes vertically through the body **232**, and a bolt passed into the hole **236** is secured in the threaded hole **224**, thereby to hold the top and intermediate sections of the mount **190** together loosely enough so as to permit the intermediate section **210** to be rotated with respect to the top section **230** and so that as the casing **12** is elevated through rotation of the intermediate section **210**, the slight tilting of the casing **12** that is caused by one end thereof rising or descending while the other end does not correspondingly change its height, is absorbed by the connection between the top section **230** and the intermediate section **210**. This result is also caused by the relative shaping of the cooperating elements of the adjacent mount sections.

The ball **242** is placed in one or more of the bores **240** in the body **232**. Ball **242** is spring biased out of bore **240** by the compression spring **244** and into the depressions **228** so as to provide the above described detent arrangement. Further support and positioning of the upper section **230** with respect to the intermediate section **210** is obtained by the peripheral step **246** beneath the top section **230** abutting and resting on the upwardly facing step **248** of the intermediate section **210**.

At the left side in FIG. **16** of the top section **230** is the mounting flange **252** having the opening **254** passing therethrough. The flange **252** is placed between the mounting flanges **26, 28** of the rear plate **20** of casing **12** and a fastening pin, screw, or the like (not shown) securely fastens the rear mounting flange **252** to the end plate **20**, but with sufficient play as to permit the above described vertical adjustment of the laser aiming device with respect to the weapon.

Referring to FIG. **15**, a U-shaped mounting bracket **262** is secured to the bar **160** by the screws **264**. The threaded shaft **266** passes through an opening **268** through the joining web **269** of the bracket **262**. The shaft **266** is held stationary against axial motion by the fixing nut **272** at the one side of the web **269** and by its own knurled, manually rotatable head **274** on the opposite side of the web **269**. The threaded shaft **266** enters into and is continuously in the threaded opening **206** in the rear mount dovetail shaped element **196**. Rotation of the wheel **274** thus moves the entire rear mount **190** across the bar **160** through the dovetail groove **166** and reorients the side to side aiming angle of the aiming device **10** with respect to the aiming point of the weapon. As the mount **190** shifts, the casing **12** will necessarily slightly swivel with respect to the bottom section **192** of the mount **190**. The relative rotatability of the sections of rear mount **190** absorbs this relative rotation. Similarly, with respect to the below described front mount **280**, the relative rotatability of its sections permits this swiveling to occur.

Referring to FIG. **18**, the front mount **280** includes the bottom section **282**. Bottom section **282** includes the body **284** beneath which depends the dovetail shaped male mounting flange **286**. Dovetail shaped flange **286** is shaped to matingly fit in and is received in slot **170** in bar **160**. Atop the body **284** is the annular, top section support base **288** and the upper conical taper **292** for

being received in a cooperatingly shaped opening in the top section of the front mount. Further, the body **284** has a threaded opening **294** for receiving the fastening bolt (not shown) that holds the top and bottom sections of the front mount together.

The top section **300** of the front mount **280** is comprised of the body **302**, which has a conically shaped central opening **304** in its bottom for receiving the upwardly projecting conical surface **292** such that the top section **300** nests with the bottom section **282**. The annular, bottom rim **306** of the body **302** normally rests on the annular surface **288** of the bottom section **282**. The top section **300** has a bolt receiving opening **308** with a larger head receiving opening **309** such that a bolt may be pressed through the opening **308** and tightened into the threaded opening **294** to hold the top **300** and bottom **282** sections together. The bolt (not shown) is tightened so as to hold the sections together, but is loose enough so as to permit the tilting of the laser device when its vertical orientation is adjusted and is loose enough to permit the slight horizontal swiveling that occurs when the horizontal aiming point of the aiming device is adjusted.

At the side of the top section **300** is the mounting flange **310** with the pin receiving opening **312** passing therethrough. The flange **310** is inserted between the flanges **77** on the front plate **60** and a pin, screw or bolt (not shown) passes through the aligned openings **79, 312** to fasten the aiming device casing **12** to the front mount **280**.

The aiming device must be triggered to operate. In accordance with a feature of the invention, the device that operates the aiming device, i.e. the operator, is always so positioned that when the trigger **316** of the weapon is operated or pulled by the marksman, that action also moves the operator of the aiming device. In accordance with a further aspect of the invention, the aiming device is activated as the weapon trigger **316** is started on its movement toward firing the weapon, but before the trigger has been pulled sufficiently to fire the weapon. With the trigger of the weapon partially depressed, the laser beam is moved as the weapon is aimed. When the weapon is finally aimed because the laser beam is illuminating the target, the partial operation of the trigger **316** can be completed to fire the weapon. Thus, the operator of the weapon need not make any separate or unusual movements to aim the weapon. The aiming can be done during normal operation of the trigger of the weapon.

Referring to FIGS. **2, 4** and **20**, one embodiment of the laser aiming device operator **320** according to the invention includes a microswitch **322** with a stationary contact **324** extending from the housing of the switch and a movable, weapon trigger operated contact arm **326** also extending from the housing of the switch. The trigger operated contact arm **326** in the illustrated arrangement comprises a curved metal spring. As shown in FIG. **2**, the spring **326** is positioned directly behind the trigger **316** and when the trigger is pulled, the spring contact arm **326** is moved against the contact **324** to complete the circuit through the microswitch **322**, thereby to activate the laser aiming device. Continued squeezing of the trigger **316** to fire the weapon **180** merely straightens the spring **326** somewhat. When the trigger **316** is released after the weapon has been fired, the spring **326** restores itself to the condition where it is separated from the contact **324**.

For holding the microswitch **322** and particularly its contact arm **326** at the desired location behind the trigger **316**, the microswitch **322** is secured to the mounting plate **330** which is positioned at one side of the weapon just above the trigger. A bar **332** passes inside and across the trigger guard to the other side of the weapon. The resilient arm **334** is pivotally mounted to the bar **332** at the pivot mount **336** and the arm **334** is movable to a position where it squeezes against the opposite side of the weapon, thereby drawing the plate **330** against the side of the weapon and securely holding the entire operator **320** in place. The microswitch **322** is connected through the cable **13** with the casing **12** and extends to the battery **40**, thereby to complete the electrical connection.

Other types of aiming device operators may be used. The only significant feature is that the operator that activates the laser aiming device should be associated with the trigger of the weapon so that as the weapon trigger is partially operated, the aiming device is activated.

Another aiming device operator **340** within the scope of the invention shown in FIG. **21** includes a microswitch **342** located, not near the trigger of the weapon, but at or on or near the casing **12** of the laser aiming device. An element **344** that is operated by the trigger of the weapon, i.e. the functional analog of the arm **326** in FIG. **19**, is a depressible plunger **344** positioned directly behind and in the path of movement of the weapon trigger and attached at the end of a mechanical force transmitting cable **346**, such as a Bowden cable. When the weapon trigger is operated, the plunger is moved and the force transmitting cable transmits the mechanical force through its plunger **348** to contact the operating arm **30** of switch **350** to close the switch **342** at the casing **12** of the aiming device, which then activates the laser aiming device. Other elements of operator **340** analogous to those of operator **320** are numbered with the same reference numerals and are not further described.

Another alternative would be to have the operating switch which activates the aiming device be connected with a pivotable post depending from the casing **12** and hanging next to the trigger of the weapon. As the weapon trigger is operated, the depending post necessarily is also engaged by the markman's finger and rotated to close the switch that activates the laser aiming device. Other switches and operators for the laser aiming device can be envisioned within the contemplation of the invention.

Although the present invention has been described in connection with a preferred embodiment thereof, many variations and modifications will now become apparent to those skilled in the art. It is preferred, therefore, that the present invention be limited not by the specific disclosure herein, but only by the appended claims.

We claim:

1. A weapon aiming device, comprising:

a light source; means for supplying power to said light source and being connected to said light source; means for directing light emitted by said light source in an aiming direction;

an operator, including a switch, for activating said light source, and being connected to said light source;

an aiming device mount support securable to a weapon;

zeroing means interposed between said mount support and said light source and being adjustable to reorient said light source with respect to the weapon to readjust said light source aiming direction both vertically and horizontally with respect to the aiming direction of the weapon; said zeroing means comprise a front mount located nearer the muzzle of the weapon and a rear mount located further from the muzzle;

said mount support comprises an elongated bar; said bar having a front formation thereon to which said front mount is attached; said bar having a rear formation thereon, spaced from said front formation, to which said rear mount is attached; said bar having opposite front and rear ends near said front and rear mounts, respectively;

both of said mounts being connected to and supporting said light source; one of said mounts being vertically extendable and retractable with respect to said mount support; one of said mounts being laterally movable with respect to said mount support;

the respective said formation for said laterally movable mount comprises a first groove extending laterally across said bar for permitting lateral motion of said laterally movable mount across said bar; said laterally movable mount including first groove engaging means which are in said first groove for guiding lateral motion of said laterally movable mount; laterally movable mount moving means connected between said laterally movable mount and said bar and being adjustable for laterally moving said laterally movable mount with respect to said bar;

the other said formation on said bar comprises a second groove extending from the respective said end of said bar nearer to the other said mount and said second groove extending to the position of the other said mount when it is mounted on said bar; the other said mount including second above engaging means which are received in said second groove, and the engagement between said second groove and said second groove engaging means being shaped and positioned to prohibit lateral motion of the other said mount across said bar.

2. The weapon aiming device of claim **1**, wherein said light source is a laser.

3. The weapon aiming device of claim **1**, wherein it is the same one of said mounts that is both vertically and laterally movable with respect to said mount support.

4. The weapon aiming device of claim **1**, wherein said bar includes weapon engaging means adapted to mate with cooperating means on a weapon, thereby to mount said bar to a weapon.

5. The weapon aiming device of claim **1**, wherein

said first groove is a dovetail shaped groove and said first groove engaging means comprises a dovetail shaped male element depending beneath said laterally movable mount;

said second groove comprises a dovetail shaped groove and said second groove engaging element comprises a dovetail shaped male element depending beneath the other said mount.

6. The weapon aiming device of claim **1**, wherein said laterally movable mount has a threaded opening therein directed laterally across said bar; said laterally movable mount moving means comprises a screw threaded shaft matingly received in said threaded opening in said laterally movable mount;

shaft support means attached to said bar for holding said shaft to permit rotation thereof, while holding said shaft against lateral motion across said bar, whereby rotation of said shaft in said threaded opening shifts said laterally movable mount laterally across said bar.

7. The weapon aiming device of claim **1**, further comprising a shaft directed laterally across said bar and also engaging said laterally movable mount; shaft supporting means attached to said bar; said shaft being movable with respect to said shaft supporting means to move said laterally movable mount laterally across said bar.

8. The weapon aiming device of claim **1**, wherein said laterally movable mount is said rear mount.

9. A weapon aiming device, comprising:

a light source; means for supplying power to said light source and being connected to said light source; means for directing light emitted by said light source in an aiming direction;

an operator, including a switch, for activating said light source, and being connected to said light source;

an aiming device mount support securable to a weapon;

zeroing means interposed between said mount support and said light source and being adjustable to reorient said light source with respect to the weapon to readjust said light source aiming direction both vertically and horizontally with respect to the aiming direction of the weapon; said zeroing means comprise a mount support and a front mount located nearer the muzzle of the weapon and a rear mount located further from the muzzle; both of said mounts being connected to said mount support and being connected to and supporting said light source; one of said mounts being vertically extendable and retractable with respect to said mount support; one of said mounts being laterally movable with respect to said mount support;

said mount support comprises an elongated bar; said bar having a front formation thereon which said front mount is attachable; said bar having a rear formation thereon, spaced from said front formation, to which said rear mount is attachable;

for said laterally movable mount, the respective said formation on said bar is adapted to permit lateral motion of said laterally movable mount across said bar; laterally movable mount moving means connected between said laterally movable mount and said bar and being adjustable for laterally moving said laterally movable mount with respect to said bar;

said laterally movable mount being comprised of three vertically stacked sections, including a bottom section which is attachable to said mount support, an intermediate section, and a top section atop said intermediate section and attached to said intermediate section in a manner that permits relative rotation of said intermediate section with respect to said top section, said top section being connectable to said light source for supporting it;

the other said mount being comprised of two vertically stacked sections, including a second bottom section attachable to said mount support and a second top section connectable to said light source for supporting it and also attached to said second

bottom section in a manner that permits relative motion of said second top and said second bottom sections;

said second bottom section having a top which is shaped to have a conical taper, and said second top section having a bottom with a cooperatingly shaped conically tapered opening formed therein; said conical taper being inserted into said conically tapered opening, thereby enabling relative motion between said second bottom and said second top sections of the other said mount.

10. A weapon aiming device, comprising:

a laser light source; said laser light source includes a laser tube; means for supplying power to said laser light source and being connected to said laser light source; means for directing light emitted by said laser light source in an aiming direction;

an operator, including a switch, for activating said light source, and being connected to said light source;

said means for supplying power to said light source comprising a battery and a transformer connected to said battery for transforming the voltage of said battery to a voltage usable by said light source; said light source being connected to said transformer;

a casing; said casing comprising a hollow tube having a rear end and having a front end; said light source and said means for supplying power to said light source both being located inside and being supported within said casing;

laser tube support means located in said tube casing for supporting said laser tube at a constant orientation with respect to said casing, thereby giving said laser tube a constant said aiming direction with respect to said casing;

said laser tube having a light outlet aimed at said aiming direction; said means for directing light comprising said casing having a light outlet aligned with said laser tube light outlet; a spring located in said casing for normally biasing said laser tube to bias said laser tube light outlet toward said casing light outlet;

said transformer and said battery being aligned inside said casing, and said laser tube being positioned next to and being oriented to extend parallel to the aligned said transformer and said battery;

a rear plate sealingly secured over said tube rear end and a front plate sealingly secured over said tube front end; front and rear plate joining means for drawing said plates together, thereby to hold said transformer and said battery and said laser tube in position in said casing; p1 an aiming device mount support securable to a weapon;

zeroing means interposed between said mount support and said casing and being adjustable to reorient said casing and said light source therein with respect to the weapon to readjust said light source aiming direction with respect to the aiming direction of the weapon.

11. The weapon aiming device of claim **10**, wherein said switch of said operator is connected so that when said switch is closed, it activates said light source by completing an electric circuit including said means for supplying power to said light source and including said light source.

12. The weapon aiming device of claim **10**, further comprising a partition in said casing between said transformer and said battery; means, including said front and rear plate joining means, for urging said transformer and said battery against said partition; electric contact means on said partition for contacting said battery and said transformer and for electrically connecting them.

13. In combination, a weapon aiming device and a weapon to be aimed by said aiming device;

said weapon being of the type to fire a projectile and said weapon including a trigger which is movable in one direction to operate said weapon to fire a projectile; said aiming device being secured to said weapon by said aiming device mount support;

said aiming device comprising:

a light source, means for supplying power to said light source and being connected to said light source; means for directing light emitted by said light source in an aiming direction;

said aiming device being securable to a weapon;

an operator, including a switch, for activating said light source, and being connected to said light source; said operator comprising a movable means adapted to be placed at the trigger of the weapon to be aimed and said movable means being movable during operation of the weapon trigger to operate said switch to activate said light source;

force transmitting means between said movable means and said switch for transmitting motion of said movable means to said switch;

said movable means of said operator being so positioned as to be engaged by said weapon trigger as said trigger is moved in said one direction, thereby to move said movable means to cause said operator to activate said light source and the placement of said movable means causes said movable means to be operated to fire said weapon.

14. The combination of claim **13**, wherein said light source is a laser.

15. The combination of claim **13**, wherein said trigger of said weapon must be moved a first distance in said one direction to fire said weapon; said movable means being so designed and placed that motion of said trigger in said one direction a distance less than said first distance causes said movable means to activate said light source.

16. The combination of claim **15**, wherein said force transmitting means comprises a force transmitting cable means.

17. A weapon aiming device, comprising:

a light source; means for supplying power to said light source and being connected to said light source; means for directing light emitted by said light source in an aiming direction;

an operator, including a switch, for activating said light source, and being connected to said light source;

an aiming device mount support securable to a weapon;

zeroing means interposed between said mount support and said light source and being adjustable to reorient said light source with respect to the weapon to readjust said light source aiming direction both vertically and horizontally with respect to the aiming direction of the weapon; said zeroing means comprise a mount support and a front mount located nearer the muzzle of the weapon and a rear mount located further from the muzzle; both of said mounts being connected to said mount support and being connected to and supporting said light source; one of said mounts being vertically extend-

able and retractable with respect to said mount support; one of said mounts being laterally movable with respect to said mount support;

said mount support comprises an elongated bar; said bar having a front formation thereon to which said front mount is attachable; said bar having a rear formation thereon, spaced from said front formation, to which said rear mount is attachable;

for said laterally movable mount, the respective said formation on said bar is adapted to permit lateral motion of said laterally movable mount across said bar; laterally movable mount moving means connected between said laterally movable mount and said bar and being adjustable for laterally moving said laterally movable mount with respect to said bar;

said laterally movable mount being comprised of three vertically stacked sections, including a bottom section which is attachable to said mount support, an intermediate section, and a top section atop said intermediate section and attached to said intermediate section in a manner that permits relative rotation of said intermediate section with respect to said top section, said top section being connectable to said light source for supporting it;

the other said mount being comprised of two vertically stacked sections, including a second bottom section attachable to said mount support and a second top section connectable to said light source for supporting it and also attached to said second bottom section in a manner that permits relative motion of said second top and said second bottom sections;

the respective said formation for said laterally movable mount comprising a first groove extending laterally across said bar and said laterally movable mount including first groove engaging means which are in said first groove for guiding lateral motion of said laterally movable mount;

said bar having opposite front and rear ends near said front and rear mounts, respectively; the other said formation on said bar comprises a second groove extending from the respective said end of said bar nearer to the other said mount and said second groove extending to the position of the other said mount when it is mounted on said bar; the other said mount including second groove engaging means which are received in said second groove, and the engagement between the other said second groove and said second groove engaging means being shaped and positioned to prohibit lateral motion of the other said mount across said bar.

18. The weapon aiming device of claim **17**, wherein

said first groove comprises a dovetail shaped groove and said first groove engaging means comprises a dovetail shaped male element depending beneath said laterally movable mount;

said second groove comprises a dovetail shaped groove and said second groove engaging element comprises a dovetail shaped male element depending beneath the other said mount.

19. An aiming device, comprising:

a light source; means for supplying power to said light source and being connected to said light source; means for directing light emitted by said light source in an aiming direction;

an operator, including a switch, for activating said light source, and being connected to said light source;

an aiming device mount support securable to an object to be aimed;

zeroing means interposed between said mount support and said light source and being adjustable to reorient said light source with respect to the object to readjust said light source aiming direction both vertically and horizontally with respect to the aiming direction of the object; said zeroing means comprise a front mount located nearer one end of the object and a rear mount located further from the one end;

said mount support comprises an elongated bar; said bar having a front formation thereon to which said front mount is attached; said bar having a rear formation thereon, spaced from said front formation, to which said rear mount is attached; said bar having opposite front and rear ends near said front and rear mounts, respectively;

both of said mounts being connected to and supporting said light source; one of said mounts being vertically extendable and retractable with respect to said mount support; one of said mounts being laterally movable with respect to said mount support;

the respective said formation for said laterally movable mount comprises a first groove extending laterally across said bar for permitting lateral motion of said laterally movable mount across said bar; said laterally movable mount including first groove engaging means which are in said first groove for guiding lateral motion of said laterally movable mount; laterally movable mount moving means connected between said laterally movable mount and said bar and being adjustable for laterally moving said laterally movable mount with respect to said bar;

the other said formation on said bar comprises a second groove extending from the respective said end of said bar nearer to the other said mount and said second groove extending to the position of the other said mount when it is mounted on said bar; the other said mount including second groove engaging means which are received in said second groove, and the engagement between said second groove and said second groove engaging means being shaped and positioned to prohibit lateral motion of the other said mount across said bar.

20. An aiming device, comprising:

a light source; means for supplying power to said light source and being connected to said light source; means for directing light emitted by said light source in an aiming direction;

an operator, including a switch, for activating said light source, and being connected to said light source;

an aiming device mount support securable to an object to be aimed;

zeroing means interposed between said mount support and said light source and being adjustable to reorient said light source with respect to the object to readjust said light source aiming direction both vertically and horizontally with respect to the aiming direction of the object; said zeroing means comprise a mount support and a front mount located nearer one end of the object and a rear mount

located further from the one end; both of said mounts being connected to said mount support and being connected to and supporting said light source; one of said mounts being verticaly extendable and retractable with respect to said mount support; one of said mounts being laterally movable with respect to said mount support;

said mount support comprises an elongated bar; said bar having a front formation thereon to which said front mount is attachable; said bar having a rear formation thereon, spaced from said front formation, to which said rear mount is attachable;

for said laterally movable mount, the respective said formation on said bar is adapted to permit lateral motion of said laterally movable mount across said bar; laterally movable mount moving means connected between said laterally movable mount and said bar and being adjustable for laterally moving said laterally movable mount with respect to said bar;

said laterally movable mount is comprised of three vertically stacked sections, including the bottom one of said two sections which is attachable to said mount support, the top of one of said two sections which is an intermediate section, and a top section atop said intermediate section and attached to said intermediate section in a manner that permits relative rotation of said intermediate section with respect to said top section; said top section being connectable to said light source for supporting it;

said intermediate section having a top which is shaped to have a first conical taper, and said top section having a bottom with a cooperatingly shaped first conically tapered opening formed therein; said first conical taper being inserted into said first conically tapered opening, thereby enabling relative motion between said intermediate and said top sections of said laterally movable mount;

said vertically extendable and retractable mount being comprised of two vertically stacked sections, including a second bottom section attachable to said mount support and a second top section connectable to said light source for supporting it and also attached to said second bottom section in a manner that permits relative motion of said second top and said second bottom sections;

said second bottom section having a top which is shaped to have a second conical taper, and said second top section having a bottom with a cooperatingly shaped second conically tapered opening formed therein; said second conical taper being inserted into said second conically tapered opening, thereby enabling relative motion between said second bottom and said second top sections of said vertically extendable and retractable mount.

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